US Wind Offshore Wind Project

TRC

Offshore Ocean City, Maryland

Aircraft Detection Lighting System (ADLS) Efficacy Analysis

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Summary

Capitol Airspace conducted an Aircraft Detection Lighting System (ADLS) efficacy analysis for the US Wind Offshore wind project offshore Ocean City, Maryland. At the time of this analysis, 125 wind turbine locations had been identified (black points, ***Figure 1***) within the 125-square-mile study area (blue area, ***Figure 1***). This analysis utilized historic air traffic data obtained from the Federal Aviation Administration (FAA) in order to determine the total duration that an ADLS-controlled obstruction lighting system would have been activated. The results of this analysis can be used to predict an ADLS's effectiveness in reducing the total amount of time that an obstruction lighting system would be activated.

An ADLS utilizes surveillance radar to track aircraft operating in proximity to the wind project. The ADLS will activate the obstruction lighting system when aircraft enter the light activation volume and will deactivate the system when all aircraft depart. As a result, the ADLS provides nighttime conspicuity on an as-needed basis thereby reducing the amount of time that obstruction lights will be illuminated. Depending on the volume of nighttime flights transiting a wind project's light activation volume, an ADLS could result in a significant reduction in the amount of time obstruction lights are illuminated.

Historical air traffic data for flights passing through the light activation volume indicates that ADLS-controlled obstruction lights would have been activated for a total of 5 hours 46 minutes and 22 seconds over a one-year period for 938-foot-tall wind turbines, the PDE maximum turbine height. Considering the local sunrise and sunset times, an ADLS-controlled obstruction lighting system could result in over a 99% reduction in system activated duration as compared to a traditional always-on obstruction lighting system.

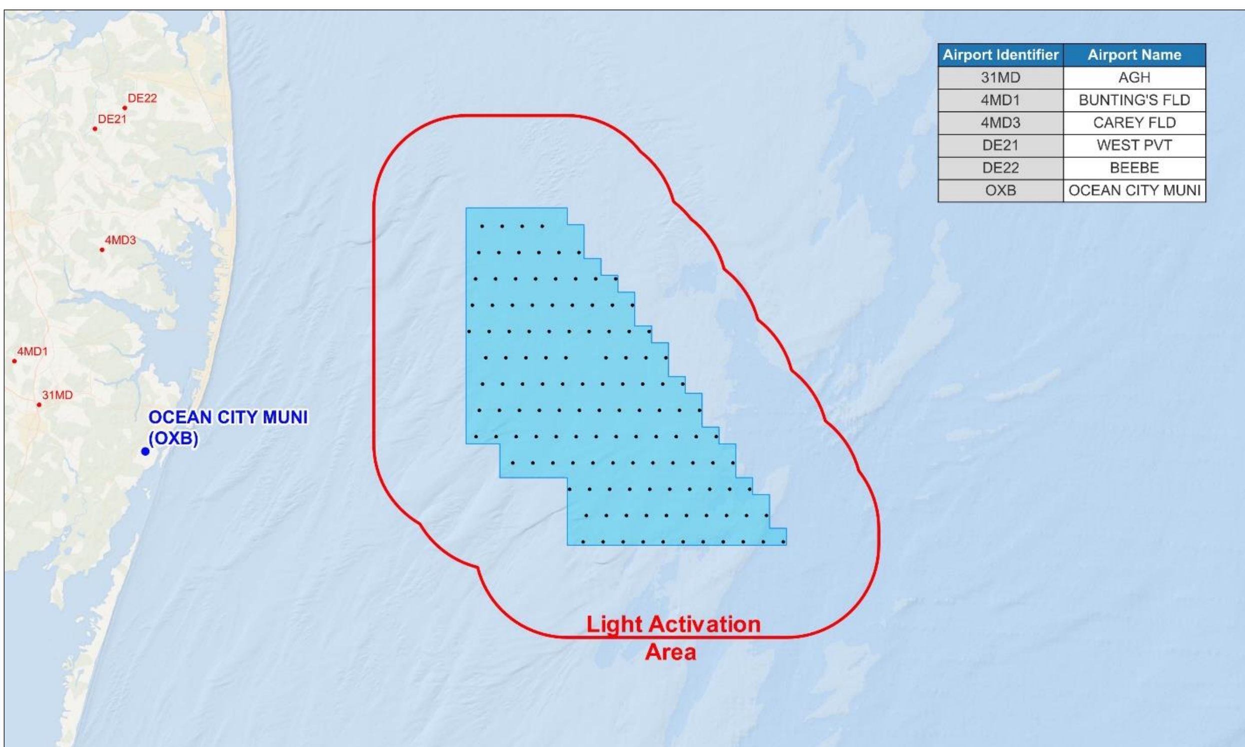

Figure 1: Public-use (blue) and private-use (red) airports in proximity to the US Wind Offshore wind project (blue area)

Methodology

Capitol Airspace analyzed FAA National Offload Program (NOP) radar returns in proximity to the US Wind Offshore wind project for the 2020 calendar year. Flight tracks from the 2020 dataset were assessed since it contained a greater number of flights in the affected airspace than the 2019 and 2021 datasets. FAA NOP data only include secondary radar returns which are created if the identified aircraft is equipped with a transponder. Aircraft operations without an active transponder were not captured as part of this dataset.

The following process was used to determine the frequency of nighttime aviation operations in proximity to the US Wind Offshore wind project:

1. **Define Three-Dimensional Light Activation Volume** – In accordance with FAA Advisory Circular 70/7460-1M, obstruction lights controlled by an ADLS must be activated and illuminated prior to an aircraft reaching three nautical miles from, and 1,000 ft above, any obstruction. However, the actual light activation volume will vary depending on the specific ADLS selected for use. At the time of this analysis, a specific ADLS had not been selected for the US Wind Offshore wind project. In order to account for varying radar systems as well as aircraft speeds and descent rates, Capitol Airspace conservatively assessed a 3.55-nautical mile buffer (solid red outline, ***Figure 1***) around the US Wind Offshore wind project at altitudes up to 3,500 ft above the highest wind turbine location (4,500 feet above mean sea level [AMSL] based on the PDE maximum turbine height).
2. **Calculate Sunrise and Sunset** – Sunrise and sunset times were calculated for each day of the year based on the United States (US) Naval Observatory definition of sunrise and sunset. Sunrise time was calculated at the westernmost edge of the light activation perimeter. Sunset time was calculated at the easternmost edge of the light activation perimeter. The data was validated through comparison to the US Naval Oceanography Portal.[1]
3. **Select Nighttime Radar Returns** – Since traditional obstruction lights can rely on ambient light sensors to identify darkness, nighttime was considered to occur between 30 minutes prior to sunset until 30 minutes after sunrise. This represents the time during which a traditional obstruction lighting system would likely be activated. All radar returns within the light activation volume that occurred during this period were evaluated. In accordance with guidance provided by the FAA, if an ADLS loses track of an aircraft, a 30-minute timer should be initiated to keep the obstruction lights activated while the aircraft can clear the wind project area. Since the application of ADLS requires site specific radar surveillance systems that will be focused on the US Wind Offshore wind project, Capitol Airspace does not anticipate a likelihood of dropped tracks.
4. **Remove Time Overlap** – To remove the duration of overlap occurring when more than one flight transits the light activation volume at the same time, each nighttime flight was compared to every other nighttime flight. Where overlapping flights were found, the overlapping flight's duration within the light activation volume was removed from the total obstruction lighting system activation time.

[1] http://www.usno.navy.mil/USNO/astronomical-applications

Results

FAA NOP data indicates that as many as 1,271 flights had at least one radar return within the light activation volume (red outline, ***Figure 2***). However, most of these flights occurred during daytime. Using local sunrise and sunset times, Capitol Airspace determined that as many as 144 flights (purple tracks, ***Figure 3***) had at least one radar return within the light activation volume during the nighttime period when a traditional obstruction lighting system would be activated. Each of the 144 flights was further evaluated to determine the amount of time it remained within the light activation volume. Over a one-year period, these flights would have resulted in a total obstruction light system activated duration of 5 hours 46 minutes and 22 seconds for the PDE maximum turbine height.

Considering that the US Wind Offshore wind ADLS light activation perimeter observes approximately 4,714 hours of nighttime each year, an ADLS-controlled obstruction lighting system could result in over a 99% reduction in system activated duration as compared to a traditional always-on obstruction lighting system (***Table 1***).

Table 1: Monthly nighttime observed and associated light system activation durations

Month	Nighttime Observed (HH:MM:SS)	Light System Activated Duration (HH:MM:SS)
January	486:06:24	00:00:00 (0.00%)
February	412:23:27	00:00:00 (0.00%)
March	403:11:40	00:00:00 (0.00%)
April	353:00:47	00:00:00 (0.00%)
May	332:42:18	00:00:00 (0.00%)
June	306:56:28	01:15:01 (0.38%)
July	326:13:08	00:59:09 (0.28%)
August	355:05:38	00:08:08 (0.04%)
September	379:19:46	02:03:07 (0.48%)
October	430:17:14	01:07:18 (0.25%)
November	448:42:17	00:13:39 (0.05%)
December	480:19:28	00:00:00 (0.00%)
Total	**4714:18:35**	**05:46:22 (0.12%)**

Please contact ***Dan Underwood*** or ***Candace Childress*** at (703) 256-2485 with any questions regarding the findings of this analysis.

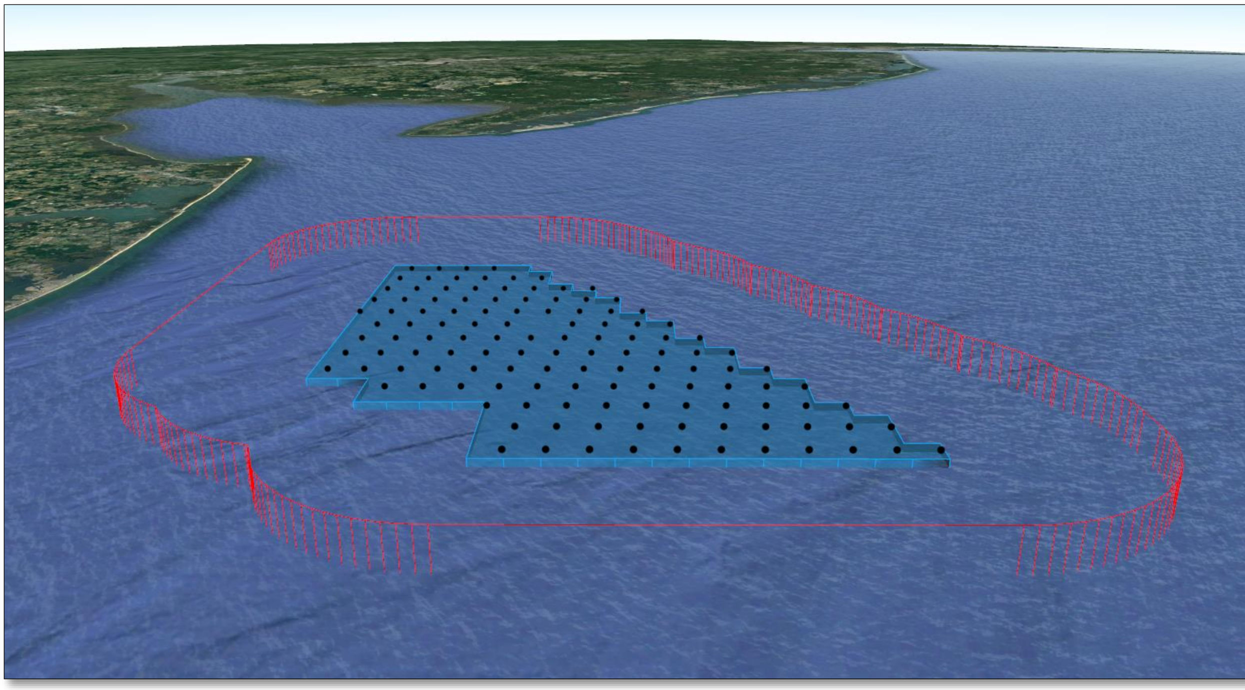

Figure 2: US Wind Offshore wind project (blue) and light activation volume (red outline)

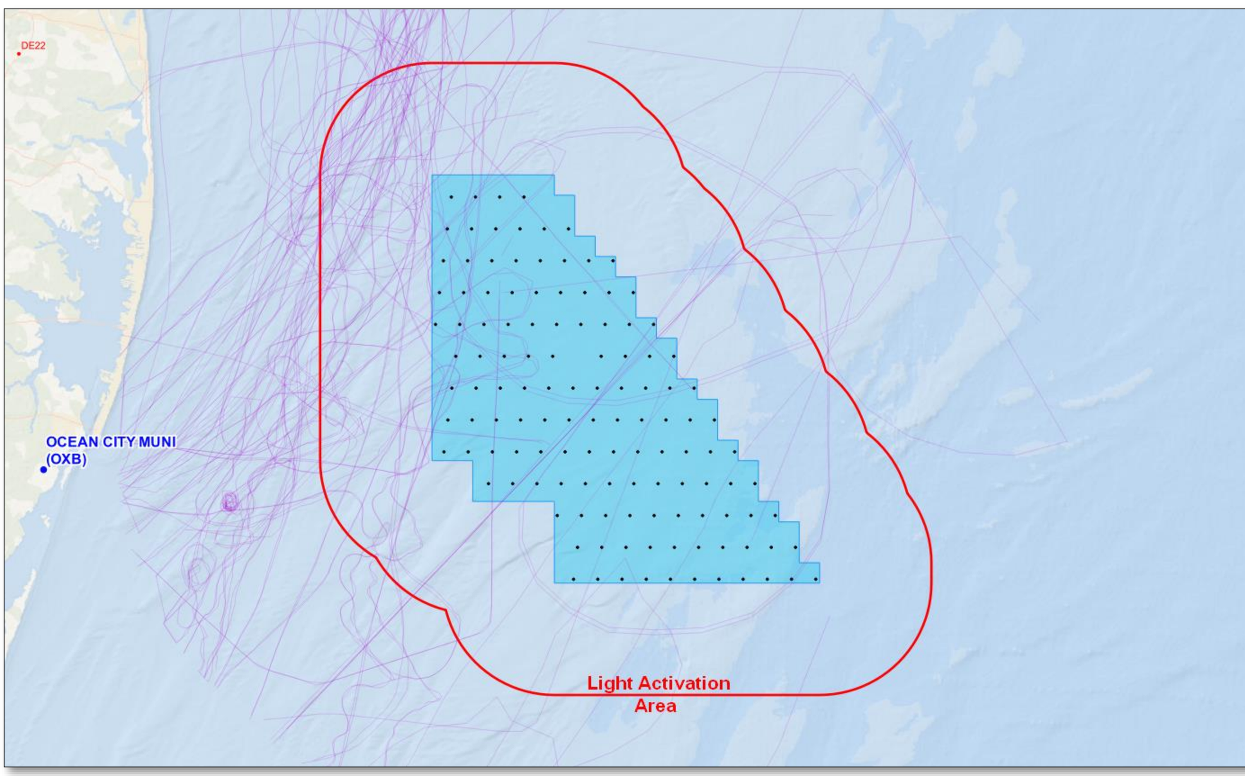

Figure 3: Flight tracks (purple) that would have activated ADLS obstruction lights (based on the PDE maximum turbine height)